

SEP 17 2007

Application Serial No. 09/373,926

AMENDMENT TO THE CLAIMS:

1. (original) A method for detecting misrepresentation of policy related information provided to an insurer by a policyholder where the information is used by the insurer in determining an amount of premium to be paid for insurance coverage provided to the policyholder, the method comprising:

selecting a plurality of insurance policies to process with a predictive model; for each selected policy, deriving variables from policy related information provided by the policyholder in connection with the selected policy; and

for each selected policy, applying the derived variables of the policy to the predictive model to generate a model score indicating the relative likelihood of misrepresented information provided by the policyholder or an expected adjustment of the premium on the policy.

2. (Currently Amended) The method of claim 1, further comprising: collecting training data including a plurality of insurance policies having misrepresented information and a plurality of policies not having misrepresented information; developing the predictive model from the training data; and storing the predictive model.

3. (Original) The method of claim 1 further comprising: converting the model score to a fraud score indicating a probability of fraud in the policy.

4. (Original) The method of claim 1, further comprising: converting the model score to the expected adjustment of the premium on the policy.

5. (Currently Amended) The method of claim 1, wherein selecting a plurality of insurance policies further comprises: for each policy, automatically determining start and end dates of a scoring

Application Serial No. 09/373,926

period ~~in which the determination of whether~~ over which misrepresented policy information is to be ~~determined~~ detected.

5 6. (Currently Amended) The method of claim 5 4, further comprising
~~determining wherein~~ the start and end dates of the scoring period for which the policy has consistent and complete data.

10 7. (Currently Amended) The method of claim 5 6, further comprising:
responsive to a policy not having consistent or complete data in the scoring
period, defining an exclusion code providing a reason that the policy was
not selected.

15 8. (Currently Amended) The method of claim 5 6, wherein the insurance policies
are workers' compensation insurance policies, and automatically determining start and
end dates of the scoring period further comprises:
defining the start and end dates such that all audit adjustments are contained
between the start and end dates.

20 9. (Original) The method of claim 1, wherein selecting a plurality of insurance
policies further comprises:
for each policy, receiving a user defined scoring period to be scored for the
policy; and automatically selecting those policies having consistent and
complete data in the respective user defined time period from which the
variables for the predictive model may be derived.

25 10. (Original) The method of claim 9, further comprising:
responsive to a policy not having consistent or complete data in the user defined
time period defining an exclusion code providing a reason that the policy
was not selected.

30 11. (Original) The method of claim 9, further comprising:

Application Serial No. 09/373,926

responsive to a policy not having consistent or complete data in the user defined scoring period, automatically suggesting a scoring period in which the policy has consistent and complete data.

5 12. (Original) The method of claim 1, wherein deriving variables from policy related information further comprises:

determining a plurality of peer groups of which the selected policy is a member;
and for each peer group or set of peer groups of which the selected policy
is a member, deriving variables from the policy information which attribute
10 characteristics of the peer group or set of peer groups to the selected
policy, or which compare the selected policy to other policies in the peer
group or set of peer groups.

15 13. (Original) The method of claim 12, wherein the derived variables estimate
the probability of a dichotomous outcome or a certain distributional statistic of a
continuous quantity for a policy, based on the peer group(s) of which the policy is a
member.

20 14. (Amended) The method of claim 12, wherein deriving variables for the policy
which compare the policy to other policies in its peer group(s) further comprises deriving
variables that compare either at least one characteristic of the policy with at least one
corresponding characteristic of the policies in its peer group(s).

25 15. (Original) The method of claim 12, further comprising:
for each of the plurality of peer groups, storing in a lookup table group statistics
for policy characteristics of the policies in the peer group; and
deriving the variables for a selected policy by determining the peer group to
which the selected policy belongs and using the statistics for the policy
characteristics for the peer group to derive the variables for the selected policy.

30

16. (Original) The method of claim 15, further comprising:

Application Serial No. 09/373,926

updating the lookup table for a peer group of the selected policy using policy information from the selected policy.

5 17. (Original) The method of claim 1, wherein deriving variables further comprises:

deriving variables from the policy information which compare the selected policy in a selected time period with the selected policy in a time period prior to the selected time period.

10 18. (Original) The method of claim 17, wherein deriving variables from the policy information which compare the selected policy in a selected time period with the selected policy in a time period prior to the selected time period further comprises:
deriving variables which quantify an amount or distribution of risk-related activities associated with the policy.

15 19. (Original) The method of claim 17, wherein deriving variables from the policy information which compare the selected policy in a selected time period with the selected policy in a time period prior to the selected time period further comprises:
determining at least one measure which is a percentage change in a policy
20 characteristics between the selected time period and the previous time period.

25 20. (Original) The method of claim 17, wherein deriving variables from the policy information which compare the selected policy in a selected time period with the selected policy in a time period prior to the selected time period further comprises:
determining a vector policy characteristics for the selected time period and a vector of the policy characteristics in the prior time period; and
determining a scalar measure of comparison between the two vectors.

Application Serial No. 09/373,926

21. (Original) The method of claim 20, wherein the scalar measure of comparison between the two vectors is computed as either a measure of distance between the two vectors or an angle measure between the two vectors.

5 22. (Original) The method of claim 17 wherein deriving variables from the policy information which compare the selected policy in a selected time period with the selected policy in a time period prior to the selected time period further comprises:
determining a percent change in a payroll share in at least one employment
classification in the selected time period relative to the previous time
10 period.

23. (Original) The method of claim 17, wherein deriving variables from the policy information which compare the selected policy in a selected time period with the selected policy in a time period prior to the selected time period further comprises:
15 determining a percent change in a payroll share in an exception group in the selected time period relative to the previous time period.

24. (Original) The method of claim 17, wherein deriving variables from the policy information which compare the selected policy in a selected time period with the
20 selected policy in a time period prior to the selected time period further comprises:
determining a vector distance between vectors of payroll percent shares in each
of a plurality of employment classes in the selected time period and in the
prior time period.

25 25. (Original) The method of claim 24, wherein the employment classes are SIC employment classes.

26. (Original) The method of claim 24, wherein the employment class groups
are NCCI employment class groups.
30

Application Serial No. 09/373,926

27. (Original) The method of claim 24, wherein the employment class groups are rate-driven employment class groups.

28. (Original) The method of claim 24, wherein the employment class groups
5 are data-driven employment class groups, each group including employment classes that are likely to appear together in payroll reports.

29. (Original) The method of claim 17, wherein deriving variables from the policy information which compare the selected policy in a selected time period with the
10 selected policy in a time period prior to the selected time period further comprises:
determining a percent change in a number of claims filed on the policy in the selected time period relative to number of claims filed on the policy in the prior time period.

30. (Original) The method of claim 17, wherein deriving variables from the policy information which compare the selected policy in a selected time period with the
15 selected policy in a time period prior to the selected time period further comprises:
determining a vector distance between a first vector of the number of claims filed in the selected time period for each of a plurality of injury types and a
20 second vector of the number of claims filed in the prior time period in each of the plurality of injury types.

31. (Original) The method of claim 1, wherein the insurance policies are workers' compensation insurance policies and the policy relative information from which
25 the variables for assessing the policies are derived includes payroll reports for the policyholder.

32. (Original) The method of claim 1, further comprising:
30 deriving direct policy variables which measure characteristics of the policyholder or the policy itself without comparison to other policies or the same policy in a prior time period.

Application Serial No. 09/373,926

33. (Original) The method of claim 32 wherein the direct policy variables are selected from the group consisting of:

- type of company of the policyholder;
- location of the policyholder;
- number of employees of the policyholder;
- number of policy cancellations;
- age of the policy;
- industry type of the policyholder;
- amount of payroll reported by the policyholder; and
- distribution of payroll reported by the policyholder with respect to at least one employment class.

34. (Original) The method of claim 1, further comprising:
deriving direct claim variables which measure characteristics of claims filed on policy.

35. (Original) The method of claim 34 wherein the direct claim variables are selected from the group consisting of:

- number of claims filed during the selected time period;
- dollar amount of claims filed during the selected time period;
- type of claims filed during the selected time period;
- number of claims filed during the selected time period relative to amount of premium paid during the selected time period; and
- number of claims filed during the selected time period relative to a size of payroll during the selected time period

36. (Original) The method of claim 1, further comprising deriving variables that measure the probability of fraud in the policy conditionally based on at least one policy characteristic of the policy.

Application Serial No. 09/373,926

37. (Original) The method of claim 1, further comprising:
applying the policy to a plurality of decision rules which identify specific
inconsistent or suspicious policy facts related to the policy, to generate an
output indicating which decision rules were violated by the policy.

5

38. (Original) The method of claim 37, wherein the decision rules are derived
from statistical analysis of insurance policies of at least one insurer which have been
determined to contain misrepresented policy information.

10

39. (Original) The method of claim 37, wherein the insurance policies are
workers' compensation insurance policies and wherein the decision rules are selected
from a group consisting of:

15

a decision rule that identifies as potentially fraudulent a policy that has an
employment class code on a claim with an injury date during the
selected time period but the employment class code for the claim is
not included in payroll reports for the policy during the selected time
period;

20

a decision rule that identifies as potentially fraudulent a policy that reports zero
payroll during the selected time period but for which one or more
certificates of insurance were issued during the selected time period;

a decision rule that identifies as potentially fraudulent a policy that reports zero
payroll during the selected time period but which has at least one claim
with an injury date during the selected time period;

25

a decision rule that identifies as potentially fraudulent a policy with an
officer who is currently or was selectedly an officer on a different policy
and where the new policy has a lower experience modification factor than
the prior policy; and

30

a decision rule that identifies as potentially fraudulent a policy that has an
employment class code on a claim and for which no premium was
reported at the time the claim was opened

Application Serial No. 09/373,926

40. (Original) The method of claim 1, further comprising:
for each selected policy, determining at least one variable which significantly contributes
to the model score for the policy; and
outputting a reason for the model score with respect to the determined at least one
5 variable.

41. (Original) The method of claim 40, wherein the insurance policies are
workers' compensation insurance policies, and wherein the significant variable is
selected from a group consisting of:

- 10 an indication of whether the policy has been previously audited;
- an indication of whether a reported payroll has been adjusted;
- a number of employment class codes in at least one payroll report of the
policyholder during the selected time interval;
- a type of company of the policyholder;
- 15 an age of the policy;
- a size of payroll of the policyholder;
- a size of a premium paid on the policy;
- an industry classification code of the policyholder;
- a distribution of payroll in at least one payroll report of the policyholder
20 during the selected time interval;
- a percent payroll share in a low rated employment class code;
- a change in a distribution of payroll in at least one payroll report of the
policyholder during the selected time interval compared with the
prior time period;
- 25 a change in an exception group payroll share in at least one payroll report
of the policyholder during the selected time interval compared with
the prior time period;
- a payroll share in a group of agriculture related employment classes;
- a payroll share in a group of construction related employment classes;
- 30 a payroll share in a group of manufacturing related employment classes;
- a payroll share in a group of government related employment classes;

Application Serial No. 09/373,926

a payroll share in at least one clerical employment classes;
a number of prior cancellations of the policy;
a ratio of the number of claims made on the policy to a size of the payroll
of the policyholder; and
5 a number of claims on the policy during the selected time interval.

Claims 42-44 (Cancelled)

45. (Original) A method of estimating a quantity corresponding to a set of
10 entities grouped using one or more hierarchical categories, the method comprising:
determining an estimate of the quantity for a first category corresponding to the
highest level of the hierarchy; and
for each subsequent category representing a current lower level of the hierarchy,
adjusting the estimate of the quantity using an estimate for the current
15 level and the estimate of the higher level.

46. (Original) The method of claim 45, wherein the quantity being estimated is a
risk factor, and each category of the hierarchy has a value for the risk factor.

47. (Original) The method of claim 45, wherein the hierarchy of categories are
20 Standard Industry Classification codes (SIC), and the quantity being estimated is risk
factor associated with each SIC code.

48. (Original) The method of claim 45, wherein adjusting the estimate of the
25 quantity comprises applying a Bayesian adjustment to the estimate using the estimate
for the current level of the hierarchy and the estimate of the quantity from the higher
level.

49. (Original) A system for detecting premium fraud in an insurance policy,
30 comprising:
a database of insurance policies, each policy associated with a policyholder and

Application Serial No. 09/373,926

having policy related data;
a policy selection process that selects from the database a number of policies for scoring;
a variable derivation process that derives for each of the selected policies
5 variables associated with the policyholder of the policy for comparing the policy to peer group policies, and variables for comparing the policy in a selected time period with the policy a time period prior to the selected time period; and
a fraud detection module that receives for each policy the derived variables and
10 generates a score indicating the likelihood of misrepresentation of policy information by the policyholder of the policy.

50. (Original) The method of claim 49, wherein the fraud detection module further comprises:

15 a predictive model that generates a model score indicating a relative likelihood of misrepresentation of policy information by the policyholder; and
a post scoring process that converts the model score into the fraud score indicating a probability of misrepresentation of policy information.

20 51. (Original) The system of claim 50, wherein the post scoring process converts the model score into an expected adjustment of premium for a policy.

52. (Original) The system of claim 50, further comprising:

25 a rule-based process that applies a plurality of rules to a selected policy to identify policies suspected of premium fraud based on inconsistent or incomplete policy related information.

53. (Original) A method for determining a usage strategy for processing insurance policies suspected of premium fraud, the suspected policies selected from a
30 plurality of insurance policies, the method comprising:
establishing a frequency for scoring the plurality of insurance policies to obtain

Application Serial No. 09/373,926

for each policy a score indicating a relative likelihood of premium fraud in the policy;

establishing a ranking function for ranking the scored policies; and

establishing a plurality of threshold scores, and for each threshold score, defining
5 an audit action for performing on policies which have a score exceeding the threshold score, but not exceeding a next greater threshold score.

54. (Original) The method of claim 53, wherein establishing a ranking function for ranking the scored policies further comprises:

10 ranking the scored policies according to their scores.

55. (Original) The method of claim 53, wherein establishing a ranking function for ranking the scored policies further comprises:

15 ranking the scored policies according to an expected adjusted premium.

56. (Original) The method of claim 53, wherein establishing a plurality of threshold scores further comprises:

establishing a first threshold score for selecting for a desk audit those policies
20 having a score exceeding the first threshold score; and

establishing a second threshold score for selecting for a field audit those policies
having a score exceeding the second threshold score, wherein the second
threshold score is greater than the first threshold score.

57. (Original) The method of claim 53, further comprising:

25 establishing a set of rules for identifying policies suspected of premium fraud.

58. (Currently Amended) The method of claim 53, further comprising:

establishing a plurality of reason codes, each reason code providing an
explanation for a policy receiving a score; and

30 establishing for each of a number of reason codes, at least one audit action to be taken in response to a policy having a score which produces the reason

Application Serial No. 09/373,926

code.

59. (Currently Amended) A method for processing insurance policies suspected of premium fraud, the method comprising;

- 5 scoring each of a plurality of insurance policies with a predictive model to
 generate for each policy a score indicating a relative likelihood of premium
 fraud;
 ranking the scored policies according to the scores;
 selecting for a desk audit those policies having a score exceeding a first
10 threshold score; and
 selecting for a field audit those policies having a score exceeding a second
 threshold score, wherein the second threshold score is greater than the
 first threshold score.

15 60. (Currently Amended) A method for processing insurance policies suspected of premium fraud, the method comprising:

- scoring each of a plurality of insurance policies with a predictive model to
 generate for each policy a score indicating a relative likelihood of premium
 fraud;
20 determining for each scored policy an expected premium adjustment;
 ranking the scored policies according to their expected premium adjustment;
 selecting for a desk audit those policies having an expected premium adjustment
 exceeding a first threshold amount; and
 selecting for a field audit those policies having an expected premium adjustment
25 exceeding a second threshold amount, wherein the second threshold
 amount is greater than the first threshold amount

61. (Currently Amended) A method of developing a predictive model of insurance premium fraud, the method comprising:

- 30 collecting from at least one insurance company policy information for a plurality
 of insurance policies;

Application Serial No. 09/373,926

determining for each policy a scoring period for scoring the policy;
selecting a training set of policies;
deriving for each policy in the training set a plurality of variables from the policy
information and from other information relevant to policy premiums;
5 applying the derived variables to an untrained predictive model to train the
predictive model to produce a measure with respect to whether the
policies are fraudulent or non-fraudulent during their respective scoring
periods ; and
selecting a subset of the derived variables for the using in the predictive model,
10 which variables significantly contribute to a prediction of whether a policy
is fraudulent during its scoring period.

62. (Original) The method of claim 61, wherein the insurance policies are
workers' compensation insurance policies, further comprising:

15 excluding from the training set policies for which no payroll is reported during the
scoring period for the policy.

63. (Original) The method of claim 61, further comprising:

20 tagging each of the policies to indicate whether the policy is fraudulent, non-
fraudulent or indeterminate; and
excluding from the training set policies which are tagged as indeterminate.

64. (Original) The method of claim 61, further comprising:

25 for each policy in the training set, providing a random value for the previously
audited variable, and applying the derived variables and the random value
of the previously audited variable to the predictive model; and
for each policy in the training set, providing actual value for the previously
audited variable indicating whether the policy was previously audited for
the scoring period, and applying the derived variables and the actual value
30 of the previously audited variable to calibrate the scores produced by the
predictive model.